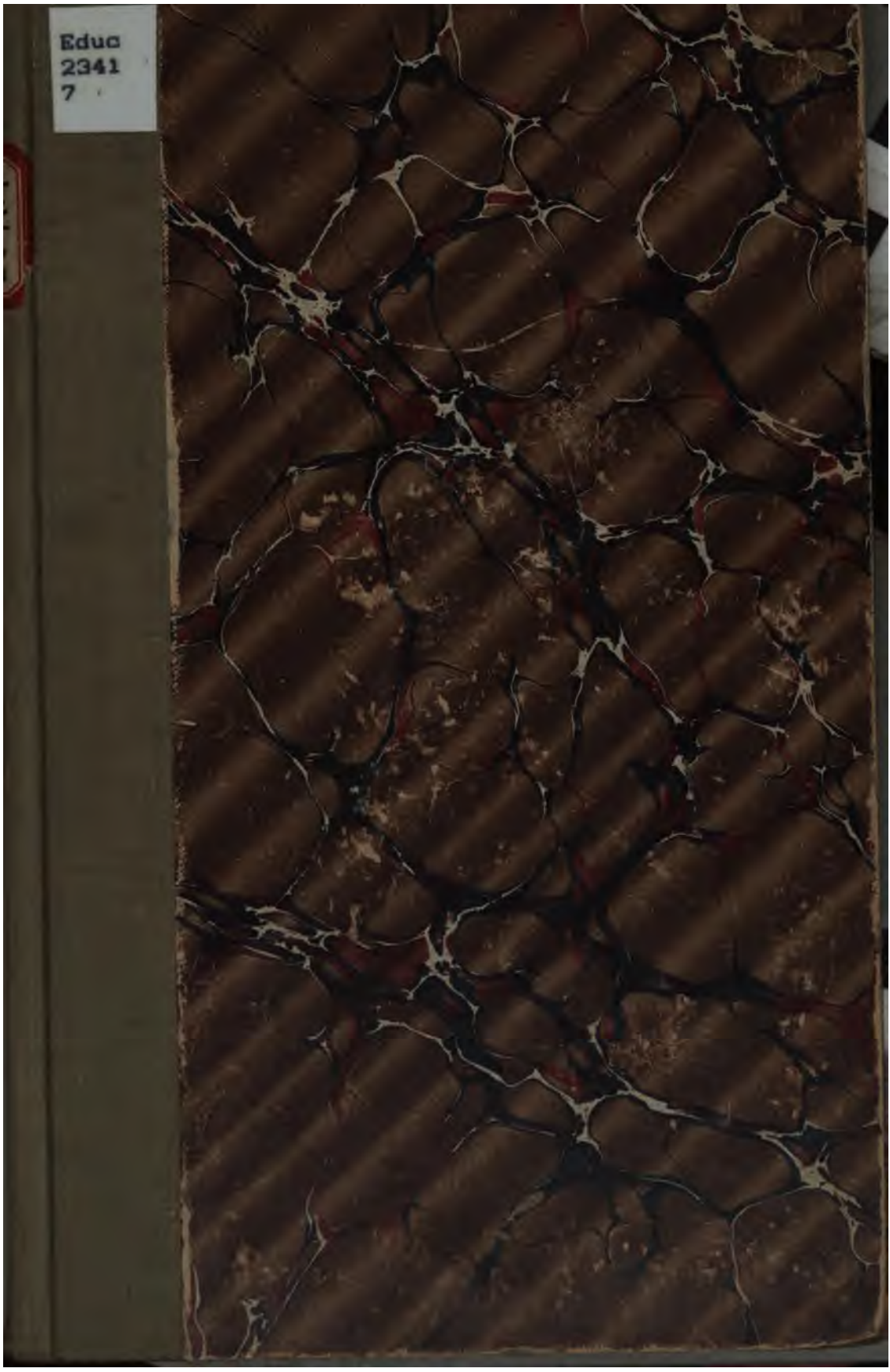
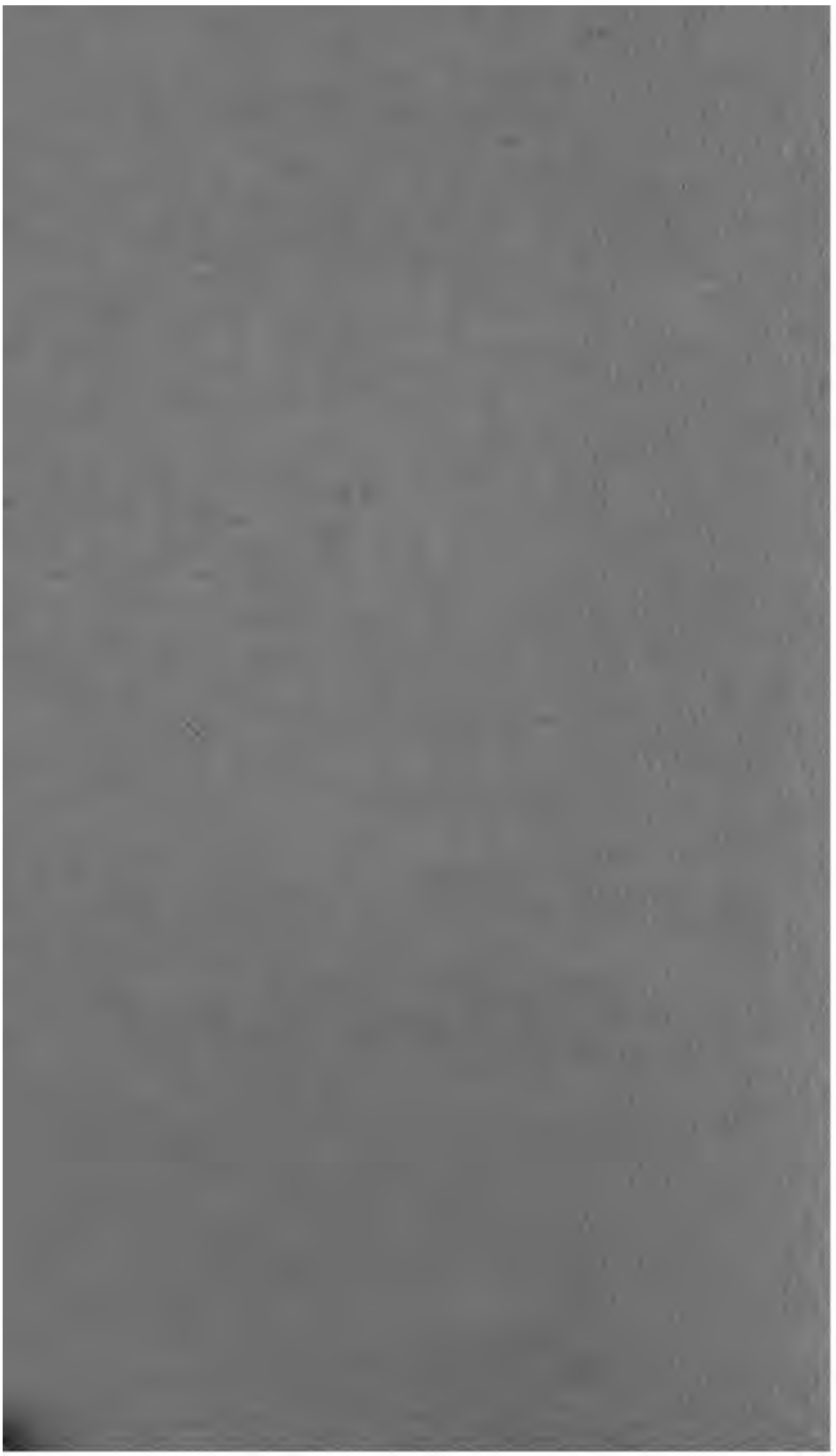


The Evergreens

Methods of Study in Public School

A Home Teacher

By C. M. WEED, under the Direction of
F. W. RANE, State Forester, State House
Boston, Mass., U. S. A.



THE

STUDY OF THE EVERGREENS

IN THE

PUBLIC SCHOOLS.

PREPARED BY
CLARENCE M. WEED,
UNDER THE DIRECTION OF
F. W. RANE, STATE FORESTER.

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PURPOSE.

This publication is offered by the State Forester as supplementary to "The Study of Trees in Our Primary Schools," issued by this office last year.

The coniferous or evergreen trees make an interesting group to study by themselves. They can be utilized by the teacher in the winter time, or dormant season of the year, when other material is not so accessible. In fact, at this season of the year they give great variety and beauty to the landscape. The interest in and association with the evergreens become very pronounced as soon as the deciduous tree leaves have changed from their natural beauty of summer to their grand autumnal glory, and finally fallen to the ground. The uses to which the evergreens are put at yuletide, and their part in making this season of the year one of the happiest to the child mind, make this the psychological time for their study.

If this treatise helps to awaken in our young and coming generation a greater interest and love in trees and nature it will have done its part.

Two other publications that teachers may find of assistance, if they do not possess them already, are: —

"The Commercial Forest Trees of Massachusetts. How you may know them. A Pocket Manual," for general use.

"The Study of Trees in Our Primary Schools," for teachers, mothers, and all interested in teaching children to love trees and nature.

Under the Resolves of 1908, chapter 121, the Governor and Council have designated that these publications be sold by the State Forester at a price not less than the cost thereof; and additional copies may be printed, the expense thereof to be paid from the receipt of such sales.

According to this decision the above-named publications are offered at the following prices: —

"The Commercial Forest Trees of Massachusetts. How you may know them. A Pocket Manual," for five cents a copy at this office, or by mail for two cents extra.

"The Study of Trees in Our Primary Schools," for twelve cents, or by mail eight cents extra.

In case a large number is wanted, as for schools, etc., they can be forwarded by express.

These publications are neatly gotten up, and as they are in great demand (the first edition of 5,000 having been exhausted in ten days), charging for them at cost is the only feasible method of dissemination.

ACKNOWLEDGMENTS.

Dr. Clarence Moores Weed, of the Lowell State Normal School, was selected to prepare this pamphlet. Owing to Professor Weed's knowledge and interest in public school work, he requires no introduction to Massachusetts teachers. In fact, the syllabus and suggestions herein given have passed the experimental stage, and have been successfully taught as outlined.

The illustrations are from prints and drawings by pupils in the Lowell Normal School and its training schools.

F. W. RANE,
State Forester.

STATE HOUSE, BOSTON, MASS.,
Oct. 1, 1908.

The ear shares with the eye the beautiful effects of weather on the landscape. The rushing of the storm through the narrow valley, the murmuring tremor of the pines in the gentle breeze, the rustling and bowing of a field of corn in an August gale, the clatter of palmettos in a wind, the rattle of pebbles on a beach, dragged down by the retiring wave, the onset of a thunder shower, — are delights for the ear as well as the eye. — CHARLES W. ELIOT.

THE CONIFEROUS EVERGREENS.

The study of the coniferous evergreens is especially desirable early in winter, and for the lower grades may well culminate at the time of the holiday festivities.

These trees furnish the most important features of many of our winter landscapes; they are of great beauty as well as of much economic value, and they give excellent opportunities for studies of distinctive educational worth. Their branches are easily obtained, and when brought into the schoolroom are of decided decorative value. They may be studied to great advantage in winter as they are available at a time when it is most difficult to get material for nature studies.

In this study of the evergreens especial emphasis should be placed upon the native species. These are to be found in fields and woods, where specimens may be gathered in abundance. A very large proportion of the conifers planted for ornamental purposes are exotic species, the determination of which is frequently difficult, and which have not the interest and associations possessed by the native sorts. An exception, however, must be made in the case of the Norway spruce, which has been so generally planted for so long a period that it is as abundant and as widely distributed as some of our native trees.

In associating the evergreens with the animal life of the winter season, the skillful teacher will point out the utility of their seeds as food for the winter birds, and the great benefit of their protection as homes, not only for the birds but for rabbits and other animals that require shelter during the winter months. The value to the trees themselves of their slender leaves in shedding snow will of course be pointed out.

In most localities it is a comparatively easy matter to get abundant material for the study of the evergreens. This is

one reason why the subject should be reserved for the winter season. Two or three small branches will furnish enough leaves of a given species to suffice for a whole class, and wherever there are large bearing trees, with little trouble one

ARBOR VITÆ

can get the cones which are so necessary to an adequate study of these trees. The cones of the white pine may generally be found in abundance underneath the trees, while those of the pitch pine, though generally less numerous on the ground, are frequently within easy reach upon the lower branches. By a little searching one may often find trees which have

been blown over or cut down, so that the cones in the topmost branches may easily be reached. This applies not only to the pines but also to most of the conifers.

The cones of some of the spruces fall to the ground early, where they may readily be gathered. This is particularly true of the Norway spruce, the large and beautiful cones of which furnish most interesting objects for study. In the case of the black spruce, which abounds in peat bogs, the cones are generally within reach upon the smaller trees; this is also commonly true of the hemlock, the arbor vitæ and the tamarack or American larch. The curious berry-like fruits of the red juniper and the low juniper are also very easy to obtain.

The teacher who does not avail herself of the opportunity to make the collecting of these evergreens the object of many winter walks will miss a personal pleasure, and will not secure the enthusiasm from her pupils that she might easily get.

In the cities one can often obtain fir balsam and some of the spruces at Christmas time among the trees offered for sale as Christmas trees. It will frequently happen that such trees may be obtained directly from the pupils after the Christmas season is over.

In the hot, dry rooms of most schools the spruces, hemlock and other conifers whose leaves are shed in drying dry out rapidly and fall off, and may cause trouble for the janitors. This may be avoided to a considerable extent by keeping the specimens in unheated closets, or hanging them out of doors, when not in use; they will thus retain their leaves much longer.

Methods of Study.

The teacher who appreciates the value of visual impressions in nature study will display before the pupils twigs and cones of the pines, and such other conifers as do not drop their leaves in drying, mounted upon good-sized sheets of paper or cardboard and plainly labelled. She will also make upon the blackboard characteristic drawings of the various species studied, using as far as possible colored

crayons, showing the appearance of cones and branches, as well as detail drawings of the leaves upon a larger scale.

The evergreens may be used to great advantage in bringing the pupils into direct contact with real things in nature. The material is so easily obtained, and in such abundance, that there is no excuse for adopting the mere question and answer method in vogue in many of our schools. Give the pupils twigs, or at least bundles of leaves, and if possible cones, and let them use their discriminating powers in sorting the specimens as to species. Let them see for themselves the distinctive characters of each, and in the higher grades let them determine the species by reference to illustrated tree books. Then let them make careful drawings of the twigs or leaves and cones of each species, being sure that they know the name while they are making the drawings. Part of the drawings at least should be made with a lead pencil, securing as great a degree of accuracy as is possible, but some of them should be made with green and brown pencil crayons, by means of which very attractive pictures may be obtained. In the upper grades it may also be worth while to use water colors for some of the drawings.

The importance of blackboard drawings by the pupils, especially in the grades above the fourth, can hardly be overestimated. These are especially valuable for the memory drawing, and in the case of the evergreens, through the use of green and brown crayons, the great advantage of colors that simulate the actual plants may be utilized.

Very beautiful Van Dyke solar prints may be made of many of the evergreens. Examples are shown in the accompanying illustrations of the arbor vitæ and the white pine.

In addition to the drawings the pupils may use the same specimens for language work, which shall take the form of short essays in which the chief characteristics of the specimens are described. The length and completeness of these descriptions will of course vary with the development of the pupil, but something worth while may be done in any grade above the fourth. These written exercises should be upon paper the same size as the drawing paper. Dictation exercises may also be given, using poems and prose selections treating of the various evergreens.

For the written descriptive exercises the pupil in the intermediate and upper grades should have before him upon the blackboard some such outline as the following. The wise teacher will of course adapt it to the degree of development of her pupils, leaving out those things which the pupil will be unable to describe to advantage. If there are no cones it may be better to omit that topic.

Outline for Description of a Conifer.

1. Leaf: —
   - Arrangement.
   - Color.
   - Length.
   - Shape.
   - Apex.
2. Bark: —
   - Color.
   - Surface.
3. Buds: —
   - Color.
   - Shape.
   - Surface.
4. Fruit: —
   - Color.
   - Size.
   - Shape.
   - Scales.
   - Seed.
5. Tree: —
   - Manner of growth.
   - Range.

Many of the conifers have distinctive odors, which may well be noted in their study. The aromatic perfume of the arbor vitæ is very different from the resinous odor of many of the pines, and would serve to identify it at any time.

Upon the foundation laid by the studies thus outlined a more complete superstructure may be built by a study of the trees out of doors, beginning with such as may be seen from the windows of the schoolroom, and continuing as far as possible by means of outdoor excursions. Occasional reviews with actual specimens, and memory drawings of leaves and cones, as well as sketches of the growing trees, will be helpful in making permanent the pupils' knowledge of the evergreens.

The final visible result of the pupils' work may be a booklet, into which is bound the drawings, the mounted specimens, the descriptions and the written selections. The completeness of these booklets and the perfection of their work will depend, of course, upon the development of the pupil and the kind of supervision given. To some extent such booklets

may be made in every grade of the lower schools, and they certainly may be made to great advantage in the high and normal schools. Some standard size of drawing paper, which is of good shape for artistic results, should be selected. A good size is six by nine inches, as this enables one to put both the mounted specimen and the drawing upon the same sheet if desired. To accompany the drawing paper there should be sheets of writing paper of the same size, ruled or unruled, as the development of the pupils may necessitate. All the sheets are to be punched upon the left-hand six-inch margin, so that they may be bound in covers of stiffer paper, either by the ordinary brass fasteners or preferably by means of raffia. In the latter case it is desirable that three holes be punched in the margin.

Examinations.

It is very easy to determine whether the pupils know the evergreens they have been studying or not. Place a small branch and cone of each variety upon a side table, numbering each species, and let the pupil, absolutely without assistance, make a list of the names of the evergreens represented. Memory drawings may also be utilized for examinations, or the pupils may be required to write a synopsis of the distinctive characteristics of a certain number of species.

Correlations.

It may be worth while, at the risk of some repetition, to indicate briefly the correlations with other studies which may properly be carried on in connection with the study of the evergreens.

In language it is obvious that any written or oral exercise describing the evergreens is simply one phase of English expression, and may very well be utilized as work in composition. It is also readily seen that the pupil who secures, through the study of the evergreens, adequate mental images of the characteristics of the different species, and of the appearance of the trees, either singly or in forest groups, is preparing himself to appreciate references to these trees in literature. This appreciation will be increased through the

use of selections from the best writers of prose and poetry, as recommended on a previous page.

The correlation with drawing is so evident that it need scarcely be dwelt upon. No nature study is at all adequate which does not constantly afford the child opportunity to express, through graphic representation, what he sees. In the case of the coniferous trees it is especially desirable that the appearance of the tree as a whole be represented from the

point of view of the art supervisor, and that the cover designs for the booklets be made according to his suggestions. It is desirable, also, that some of the selections be from those artists who have written appreciatively of the outer world.

It is easy to see the lines which should be followed in correlating the study of the evergreens with geography. The range maps will form the foundation for this. The use which is made of these trees for commercial purposes, as lumber, as the basis for wood pulp, as the source of turpen-

tine, pine tar, Canada balsam and similar products indicates that in treating of the product the source from which it comes should receive adequate consideration. The importance of the great coniferous forests as features of the landscape and as modifiers of climate are facts of great geographic interest. The natural distribution of our various native species may also serve as a basis for interesting studies in geography.

In the lower grades the bundles of needles of the pines could advantageously be used for combinations in number work. In the higher grades interesting computations may be made as to the number of leaves on a given branch or a given tree.

The value of the conifers in forestry and in ornamental planting will of course be emphasized. Wherever practicable each pupil should be led to transplant in spring or early autumn at least one evergreen about his home. Just as soon as possible there should be an assortment of native conifers growing on the school grounds.

Sequence of Study.

A natural sequence of study of the evergreens through the grades may be indicated as follows: —

Grades 1 to 3. — Definite acquaintance, making through sense perceptions and name connections. The pupils to see, hear, feel, taste, plant and enjoy, in every way possible, as many of the evergreens as may be; and always to know the name of the species they are utilizing.

Grade 4. — Review of conifers in connection with topic of seed dispersal.

Upper Grades. — In one upper grade a definite study of the families of conifers, with individual booklets, including the native species. In other grades correlations with geography, language and drawing.

Lists for the Lower Grades.

In making out the following list the species most easily recognized are placed first, although in many localities the sequence might well be modified to meet local conditions. The sequence is of comparatively little importance, however,

provided there is a definite list for each grade, so that when the pupils enter the fourth grade they will not have been studying a few of the abundant species to the exclusion of the others. Constant reviews, of course, are necessary, but when the pupils really know a species a new one should be taken up.

First Grade.	*Second Grade.*	*Third Grade.*
1. White pine.	6. Red pine.	11. Juniper.
2. Pitch pine.	7. Fir balsam.	12. Red cedar.
3. Norway spruce.	8. Low juniper.	13. Yew.
4. Arbor vitæ.	9. Black spruce.	14. Red spruce; white spruce.
5. Hemlock.	10. American larch.[1]	15. Cypress.
		16. Southern white cedar.

A good time to begin the study of the conifers in any of the grades is late in November, four or five weeks before the holiday vacation. The subject can be gone over pretty thoroughly before the term ends, and rapidly finished when the winter term begins. It may well be followed then by a study of the broad-leaved evergreens.

The Conifers to Study.

First Year List.

White Pine (*Pinus Strobus*). — Leaves arranged in clusters of five, each leaf being long and slender and averaging from 2½ to 4 inches in length; its margins are finely serrate, and in cross-section it is triangular. Green in color, with two or three distinct whitish lines on the two lower surfaces. Bark of young twigs olive brown, covered with a brownish pubescence; bark of older twigs smooth and shining. Scars where the bundles of leaves have fallen off broadly oval, sometimes nearly circular. Buds conical, with a distinctly pointed tip; they are rather small, averaging ¼ inch in length. Cones large, slender, 4 feet to 6 feet long; scales resinous, whitish brown, each scale distinctly pointed; rather

[1] While the larch is not an evergreen it is a conifer and is usually associated with evergreens.

thin at the tip, with their apical margins rounded and smooth. Seed with wing. 9 inches long, light brown in color. One of our most important commercial trees, which is being planted in great numbers in Massachusetts for lumber purposes.

WHITE PINE.

Pitch Pine (*Pinus rigida*). — Leaves arranged in clusters of three, each leaf being long, rather stout and roughened by a row of serrations along three of the margins, the teeth pointing toward the tip. Green, with narrow rows of white spots on all the sides. Bark of young shoots yellow brown, not pubescent; its general appearance rough on account of

the scales, from in front of which the bundles of leaves come out. Bark of older branches duller yellow brown. Terminal buds very resinous, rather long, cylindrical with a conical tip, averaging ⅜ inch in length; usually two or three or more smaller accessory buds beside the main terminal bud. Cones large, broad, 2 inches long. Scales thickened at the tip, with a stout sharp spine at the middle of the outer margin; borne on the sides of the branches, often in small clusters. Seed with wing.6 inches long; wings very delicate in texture, whitish, with stripes of brown. Called also torch pine.

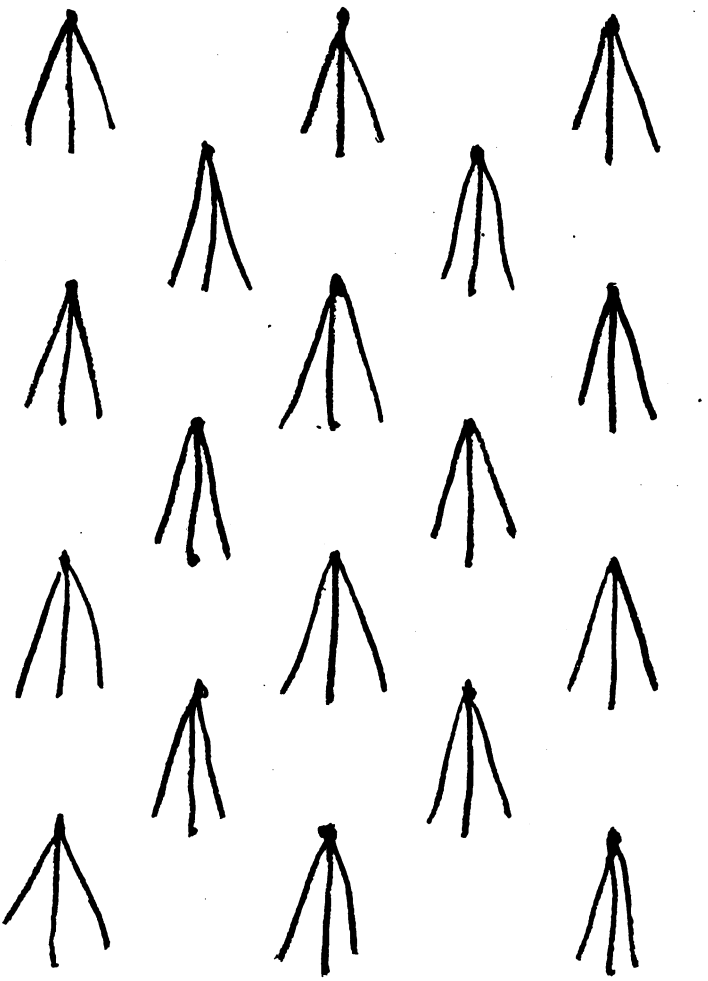
The pitch pine is a much less important tree than the white pine, but throughout the northern States it is abundant and generally distributed. The tree is at once distinguished from the white pine by the lighter color of its leaves, as well as by their coarser appearance, and by the broad cones which hang upon the branches in all parts of the tree for many years after the seeds have been dropped. The younger cones are bright reddish brown in color, while those which have been weather-beaten for many years become a dark slaty gray color.

Norway Spruce (*Picea excelsa*). — Bark of season's shoots light reddish brown; of older shoots much darker. Buds subconical, the imbricated scales reddish brown, with their margins slightly darker. Leaves yellow green, more bluish green on the under surface; arranged spirally on the branches, but the lower ones twisted around so as to give a flattened effect to the lower surface and a brushlike effect to the upper; average length, ½ inch. Cross-section of each leaf nearly square, with parallel rows of whitish dots upon each of the four sides; apex bluntly pointed. Cones very large, averaging when expanded 5 inches long by 2 inches broad. Margins of the scales rather thin, slightly and irregularly toothed, with the exposed portion having somewhat of a triangular effect, though the point of the triangle is generally truncate. Winged seeds light reddish brown in color, ⅓ inch long by ⅙ inch broad.

The Norway spruce is, perhaps, the most generally planted for ornamental purposes of all the evergreens. Although not a native species it is so universally distributed and its

cones are so characteristic that it probably will need to be included in any study of the evergreens.

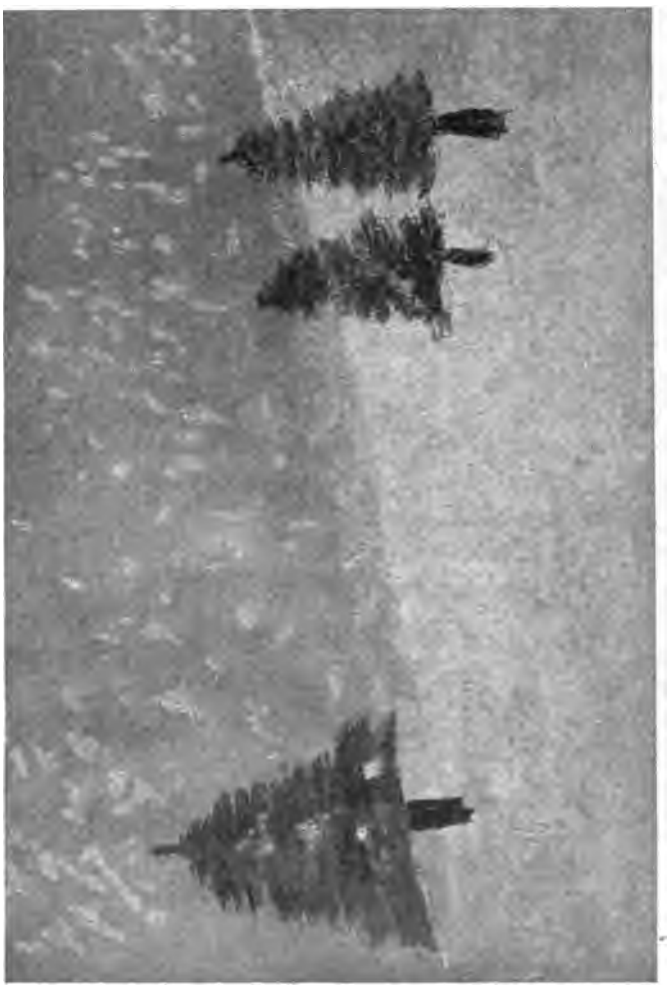
Arbor Vitæ (*Thuja occidentalis*). — Easily recognized among all the evergreens by the flattened, frond-like character



Design of Pitch Pine Needles. First Grade.

of the foliage, the leaves being very small and suggestive of closely appressed, imbricated scales. Bark of older parts of the twigs somewhat shining, grayish brown. Cones small, ovoid, .5 inches long, with few obtuse scales, chestnut brown

in color. Seeds elongate oval, broadly winged on both sides. Fully developed tree generally of conical form. Foliage with a distinct, characteristic, aromatic odor, which probably arises chiefly in the little glands upon the leaves.



CRAYON DRAWINGS OF PINE TREES. FIRST GRADE.

The arbor vitæ is one of the most generally distributed of the evergreens. It is a native of the northern States, and is probably more widely planted for hedges in private grounds and public parks than any other conifer. The Indians used to call the plant by the characteristic name of featherleaf.

Some confusion is likely to arise because in many regions this species is called the white cedar, but it is very distinct from the true white cedar, or, as the latter is sometimes called, the southern white cedar. When growing in the open the arbor vitæ assumes the form of an attractive pyramidal tree.

Hemlock (*Tsuga Canadensis*). — Branches generally horizontal and having a flattened appearance, due in part to the horizontal position of the leaves, which are commonly two ranked on each side. There is also a row of leaves along the upper side of the twig, each leaf parallel with the twig, and in typical cases lying nearly flat upon it. In these cases the apex of the leaf points to the apex of the twig, so that the normal lower surface of the leaf becomes here the upper surface; these leaves are generally less than half the length of those that project sideways. The ordinary leaves generally a little less than ½ inch long and not quite 1/12 inch wide, each leaf having a short petiole and generally a rounded tip; the upper surface bright, shining green, the under surface appearing very much lighter, due largely to the whitish stripes along the midrib and along each side of it. Crushed leaves have a distinctly resinous odor. Youngest twigs pubescent, light grayish brown in color; older twigs much darker and roughened by the scales from which the leaves have fallen. The leaves fall off in drying.

The hemlock is one of the best known and most characteristic of the evergreens. It is widely distributed throughout the United States and Canada, sometimes becoming a forest tree more than 100 feet high. The lower branches are apt to be scraggly, so that it is not so commonly planted in open ground as some of the other evergreens.

Second Year List.

Red Pine (*Pinus resinosa*). — The red pine is at once distinguished from the other native pines of the northern States by its long leaves, arranged in pairs in a rather long sheath, and its cones, borne at or near the ends of the branches. The slender leaves are 4 to 6 inches long, and the sheaths are from ½ inch to 1 inch in length. The cones are only about 2 inches long, nearly egg shaped, and the scales are smooth.

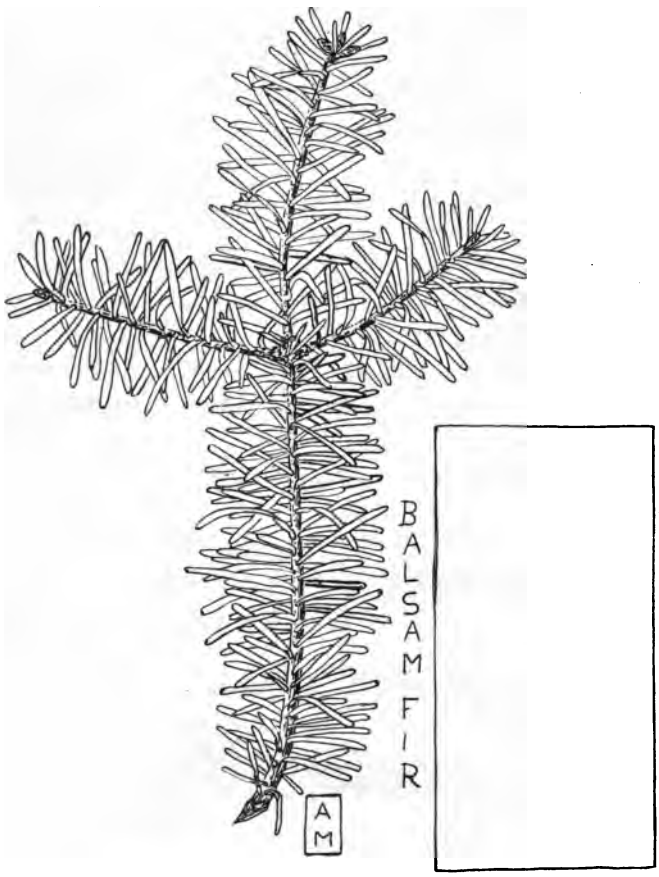
Balsam Fir (*Abies balsamea*). — General aspect of leafy horizontal branches flattened, due to the approximately horizontal position of the leaves. Upper surface a bright, clear green, under surface markedly bluish green. Each leaf sessile, averaging ¾ inch in length, with the sides nearly parallel and the apex distinctly notched; upper surface bright, deep green, with a longitudinal depression in the middle; lower surface with two broad whitish stripes, one on each side of the distinctly projecting midrib. Bark of season's shoots light reddish brown, rather thickly covered with stiff brown hairs; bark of older twigs darker. Buds clear reddish brown, with the imbricated scales covered by a transparent shiny varnish; subconical and rather small, averaging about ⅛ inch. Leaves with a distinct balsamic odor and aromatic taste. Cones large, averaging 4 inches long by 1 inch wide, with the margins of the scales rounded; projecting upward from the small branches.

The balsam fir is an abundant tree in the northern forests. It is noted for the fragrance of its branches and for the transparent resin produced upon the bark, which is the source of the Canada balsam, largely used for preserving objects for microscopic study as well as for other purposes. The wood is used largely commercially in making paper pulp.

Low Juniper (*Juniperus nana*). — A low-growing shrub, often occupying circular areas in dry pastures and on open hillsides throughout the northern States and much of Canada. Leaves awl shaped, commonly coming out of the stem in whorls of three, sometimes simply opposite in two; hollowed on under side and curved downward as seen from above. Upper surface deep green; general effect of under surface blue green on account of the whitish stripes along the middle of the under surface of each leaf. Bark of the last season's twigs very light brown, with a greenish or grayish tint; bark of the next to the last season's growth reddish brown, and of older branches dark brown. Leaves .5 inches to .6 inches long. Fruit a berry-like object, ¼ inch long by ⅕ inch broad; blue, with a glaucous bloom. The berry is formed by the union of the thickened fleshy scales, the tips of which may generally be seen. These enclose the three

nutlike seeds, which are curiously margined and sweetish aromatic in taste. When crushed the fruits have a distinctive aromatic odor. Called also ground cedar and ground hemlock.

Black Spruce (*Picea mariana*). — Bark of young branches reddish brown with a short pubescence, the hairs being brown-



ish or whitish. Leaves encircling the young twig yellow green or green in color; average length .4 inches; cross-section obtusely four angled; longitudinal lines of whitish spots generally to be found on each of the four sides; apex acute. Twigs straight or slightly curved, and commonly coming out of the main trunk nearly horizontally. Buds commonly arranged in groups of three at the ends of the more vigorous

twigs. Scales reddish brown, lower ones with long points at the tip, upper ones with thin margins; general shape ovate. Bark of older branches commonly blackish, giving a generally dark appearance to the tree, which grows especially in peat bogs from the far north southward to Michigan and New Jersey. Cone .9 inches to 1½ inches long, oval in outline, each scale having along the outer margin numerous irregular teeth; remaining on the twigs for several seasons.

The black spruce grows abundantly in the so-called spruce bogs of the northern States. It is not a very good tree for ornamental purposes, as even in its favorite localities it is commonly unsymmetrical. It is often brought into the market as a Christmas tree.

American Larch (*Larix laricina*). — In early winter the twigs are commonly bare, having dropped the leaves late in autumn. Bark of season's shoots light reddish brown, with more or less of a glaucous bloom. Buds on these shoots globose, dark reddish brown, shining, the imbricated scales having thin margins. On older twigs the bark is darker, commonly being slaty gray in color, and the buds are on the tips of very short branches.

The American larch or tamarack is one of the most abundant cone-bearing trees to be found in the swamps of the northern States. It is a distinctive tree that seems to require an abundance of moisture. In the summer its numerous fine leaves give it an attractive appearance, which is largely lost when the leaves drop off late in autumn.

Third Year List.

Common Juniper (*Juniperus communis*). — Distinguished from the low juniper by its tree-like form, with slender and rather straight leaves. It is a northern species, which extends southward to Michigan and New Jersey. By many botanists it is considered the same as the low juniper.

White Cedar (*Chamæcyparis thyoides*). — Bark of smaller twigs reddish brown, somewhat shining, with the ends more or less greenish. Leaf buds rather small, without scales. Leaves minute, scale-like, opposite and four ranked, covering the twig; tips sharply pointed. Most of the leaves have a

rounded greenish gland on the middle of the back. Fruit a curious cone, usually rather small, seldom more than ½ inch in diameter, with the scales opening on the inside and several minute winged seeds under each scale. Color of cone dull brownish purple. Called also cedar.

The white cedar is generally found along the eastern coast of the United States, although inland it occasionally occurs in deep swamps, where it often forms the principal tree growth. It is sometimes confused with the arbor vitæ, largely because the latter is also called white cedar. It is easily distinguished from the arbor vitæ by its curious brownish purple, more or less globular cones. The trees sometimes reach a height of 50 feet, and the wood is famous for its durable quality. Logs have been taken out of peat bogs and found to be in good condition to work into lumber.

Red Spruce (*Picea rubens*). — Leaves rather short, generally less than ½ inch long, obtusely pointed, dark green, with longitudinal rows of white dots showing through a lens. Surface of last season's twigs deep brownish red, with the distinct sterigmata which make up this surface covered quite densely with stout, prominent, brownish or blackish hairs, and with the projections that serve as the bases of the leaves unusually prominent. Bark of earlier years' growth darker, especially on the sides most exposed to the weather. Buds rather prominent, reddish brown or brownish red in color, darker at the obtusely pointed apex. Surface of buds hairy. Cones deep reddish brown in color, quite regular in size and shape, when fully opened averaging 1½ inches long by 1 inch wide. Scales with the margin slightly irregular, giving a suggestion of short, obscure teeth. Seed with its wing ⅓ inch long, the wing at its broadest part being half that width. General outline broadly triangular, with the light grayish brown wing terminal on the dark brown seed.

White Spruce (*Picea Canadensis*). — Bark of season's shoots light brown, with bases of leaves of a slightly reddish brown tinge; bark of older branches very much darker. Buds subconical; scales reddish brown, imbricated. Leaves bluish green, a little lighter when seen from below; those on the under part of the twig twisted around so as to give the upper

surface of the branch a much more dense appearance than the lower surface. Average length of the leaf ⅘ inch; four angled, sharply pointed at tip, with stripes of white dots on each of the four sides. The bruised leaves have a pungent, aromatic, slightly disagreeable odor. Cones generally terminal on the smaller twigs, when fully developed averaging 1½ inches long by ¾ inch broad, generally ovate cylindrical when opened. Scales with thin and more or less rounded margins, the middle of the margin being commonly truncate and generally entire. Seeds rather small; length with wing being but ¼ inch; width of wing ⅙ inch.

BLACK SPRUCE

The white spruce is one of the most beautiful of our native evergreens, forming a tall pyramidal tree, with the branches extending from the ground. The cones drop off soon after fruiting, so that they may be found beneath the tree at any time. The blossoms appear during April and May.

Red Cedar (*Juniperus Virginiana*). — The twigs of this common evergreen are especially interesting because of their two forms of leaves. In one form the leaves are small and scale-like, arranged in opposite pairs which alternate with each other, each leaf being acutely pointed and subtriangular in its shape. The other form of leaf is long and slenderly lanceolate or needle-shaped, with a very sharp point. This second form of leaf seems in general to be present upon the twigs and branches which have grown rapidly. The bark of the older parts of the branch is reddish brown and shining. The fruit is a bluish, berry-like object, the size of a pea, in which the thickened outer scales have grown together to enclose the three or four angular seeds. Called also savin.

The red cedar is an interesting and characteristic tree, scattered over almost the whole of eastern North America. It varies greatly, but in its typical form it has a characteristic columnar appearance which is very attractive. The berries form a large part of the winter food of many birds, so much so in the case of the cedar bird as to give that species its common name. The tree belongs to the genus *Juniperus* and is sometimes called the red juniper.

American Yew or Ground Hemlock (*Taxus baccata*). — General appearance of the leafy branches flattened in a way suggestive of the hemlock, the leaves, however, being much larger and more robust, and the color very much more of a yellow green. Average length of leaves ½ inch to ¾ inch; width, 1/12 inch. Each leaf narrowed at the base into a short petiole and sharply pointed with a mucronate apex; longitudinally convex above and concave below. Midrib projecting on both surfaces, more prominent on upper. Shining yellow green on the upper surface, less shining and lighter on lower surface. Bark of young twigs shining greenish brown; of older twigs reddish brown. Buds small, with rather thick imbricated scales. Each scale brownish green, with a whitish longitudinal stripe along the middle and sometimes upon the

margins. Fruit a curious, red, berry-like object, formed by the disk becoming pulpy and cup-shaped, so as almost to cover the hard seed; ¼ inch long. Small masses of the cut twigs have a curious musky odor, very different from that of any other of our evergreens. The leaves remain upon the twigs in drying.

Synopsis of the Conifers.

The conifers as a whole are distinguished from the majority of seed-bearing plants in that the seeds are borne on the face of a scale rather than enclosed in an ovary. Our native species belong to two families, — the pine family, which includes all but one of them, and the yew family. The former is characterized by cone-like fruits, while the latter is characterized by its soft, berry-like fruit.

The Pine Family (Pinaceæ).

The Pines (Pinus). — The pines are known by having the leaves needle-shaped and in clusters of two to five, and by the numerous woody cone scales. The three following species are the most generally distributed native species: —

White Pine (Pinus Strobus). — Leaves long, five in a sheath; cone long, with margins of cone scales smooth and unarmed.

Pitch Pine (Pinus rigida). — Leaves long, three in a sheath; cone broad, with outer end of cone scale armed with a pointed tooth.

Red Pine (Pinus resinosa). — Leaves long, two in a sheath; cones not long, oval conic; margins smooth.

The Larches (Larix).

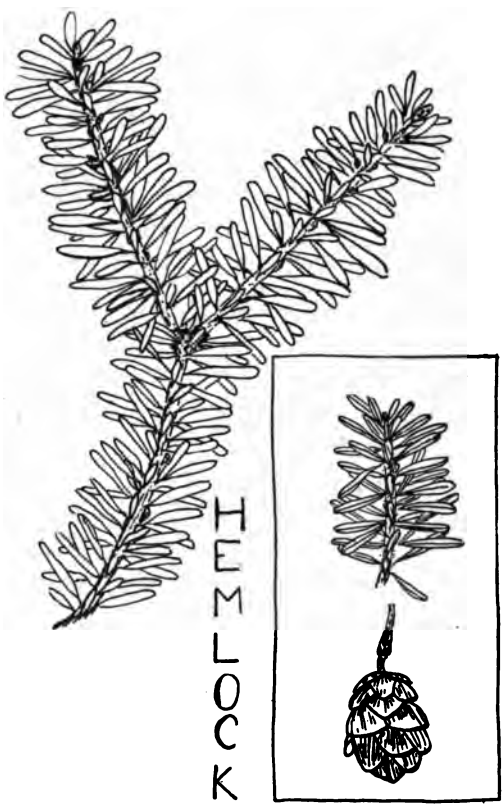
The larches are characterized by having the leaves in dense clusters on the ends of very short branches, the leaves falling off late in autumn. Our native species: —

American Larch or Tamarack (Larix laricina). — Small, short, pale green leaves, in dense clusters. Small branches, not drooping. Cones persistent and erect on twigs.

European Larch (Larix Europæa). — Distinguished by the drooping character of the branches. Commonly planted for ornament.

The Spruces (Picea).

In their general aspect the spruce trees are similar, being conical in outline and having rather short, four-sided leaves, which spread in all directions on the branches, although they



commonly project upward in a manner that gives them a brush-like effect. Leaf buds scaly and generally more or less resinous.

Norway Spruce (Picea excelsa). — Distinguished by the large cones, 4 or 5 inches long, and the drooping position of the smaller branches. An introduced species.

White Spruce (Picea Canadensis). — Distinguished by the absence of hairs upon the bark of the smaller branches; cones oblong, cylindrical.

Red Spruce (*Picea rubens*). — Distinguished by slender pubescent twigs, with sharply pointed leaves, and cones that fall off.

Black Spruce (*Picea mariana*). — Distinguished by stout pubescent twigs, with the leaves abruptly pointed, and cones that remain upon the tree.

The Hemlock (*Tsuga Canadensis*).

Only one species in the northern States, distinguished by flat leaves with short petioles.

The Balsam Fir (*Abies balsamea*).

Easily recognized by the erect cones and the rounded or notched tips of the rather large, flattened leaves.

The Bald Cypress (*Taxodium distichum*).

This tree has not before been mentioned in this article, as it is a southern species, ranging north to Delaware. The scales of the small cones are arranged spirally and the leaves are deciduous.

The Arbor Vitæ (*Thuja occidentalis*).

Easily recognized by the flattened appearance of the branches, and the small cones with opposite scales.

The Southern White Cedar (*Chamæcyparis thyoides*).

Known by the small, scaly leaves and the globose cones with peltate scales, each scale having a projecting tooth on the middle. Ranging as far north as Massachusetts.

The Junipers (*Juniperus*).

The junipers are readily known by their fleshy, berry-like fruits, which are cones modified through the thickening of the scales. The leaves vary much in size in the different species. Many leading botanists now separate the common juniper into two species, juniper and low juniper, according to its tree-like or spreading habit.

Juniper (*Juniperus communis*). — A tree-like shrub or

small tree, having awl-shaped leaves nearly ½ inch long, arranged in whorls of three. Fruit a berry-like cone, dark blue, with a glaucous bloom when ripe.

Low Juniper (*Juniperus nana*). — A low, spreading shrub, very abundant in rocky fields in many regions, with awl-shaped leaves arranged in whorls of three, and berry-like fruits; dark blue, with a glaucous bloom when ripe. Called also ground cedar.

Red Cedar (*Juniperus Virginiana*). — A tree or tree-like shrub with two kinds of leaves, partly small and scale-like and partly longer and awl-shaped. Fruit, berry-like, similar to that of the low juniper, borne on short, straight twigs.

Shrubby Red Cedar (*Juniperus Sabina*). — A shrubby procumbent form, similar to the red cedar except that the fruit is on recurved twigs. Found in northern regions, extending southward only to Maine, northern New York, Minnesota and Montana.

The Yew Family (*Taxaceæ*).

The Yew (*Taxus Canadensis*). — Characterized by the red, pulpy, resinous fruit partially enclosing the seed, and the linear leaves with short petioles and awl-shaped tips. A low shrub.